Field Representative Performance Measures for Strategically Allocating CAPI Effort

FedCASIC
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Office of Survey and Census Analytics
U.S. Census Bureau

Performance Management

"The performance management process is used to communicate organizational strategic goals, reinforce individual employee accountability for meeting those goals, and track and evaluate individual and organizational performance results."

(Dept. of Commerce Performance Management Handbook)

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Performance for Field Representatives (FRs)

If our goal is to obtain the highest quality data as cost efficiently as possible…

- How do we include the *data quality* and *cost efficiency* in performance measures today?

- Is there a better way?

Performance Measures Today (1)

Response rate (data quality):

- **Weight**: primary component of element with 40% weight

- **Definition**: responses / eligible cases

- **Standard**: each case assigned one of three difficulty ratings based on block-group. Three national standards per survey.

Performance Measures Today (2)

Production rate (cost efficiency):

- **Weight**: primary component of element with 30% weight

- **Definition**: interviewing hours / cases

- **Standard**: each Field Rep assigned to a county; each county assigned to one of six sets of counties in region; each set has a regionally-defined production rate standard.

Why Consider Alternative Measures?

- There are 270 standards for different surveys and areas. They're fair but difficult to manage. Can we get it down to a single standard?

- Many FRs work multiple surveys. Combining response rate and production rate performance across surveys and areas is surprisingly complex.

- We know there are better measures of data quality than survey response rates—the Center for Adaptive Design is already using them!

Response Efficiency Rate

Efficiency Rate (in general):

Ratio of desired output to total input

Response Efficiency Rate:

The number of responses obtained per interviewing hour expended

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Example: Response Efficiency Rate

- An FR working on ACS-HU in Blue County* obtained 12 responses and charged 30 interviewing hours. His response efficiency rate was therefore 12/30 = 0.40 responses per interviewing hour.

* All place names in this presentation are fictional, but the values are realistic for some areas of the country

Expected Response Efficiency Rate

Three quantities needed:

- *Expected Response Rate* for each survey and area
- *Expected Production Rate* for each survey and area
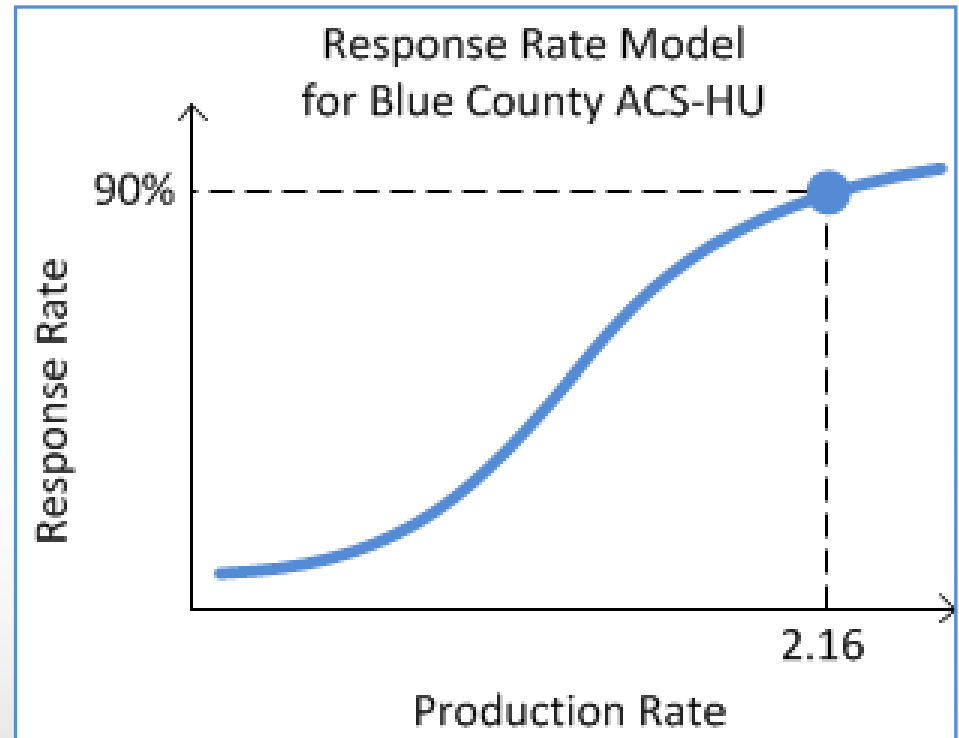- *Expected Eligibility Rate* for each survey and area

Expected Response Efficiency Rate

$$= \frac{\text{Expected Response Rate} \times \text{Expected Eligibility Rate}}{\text{Expected Production Rate}}$$

How to Set Expectations?

Two Ways

- Existing performance standards (single dot)

- Statistical model (curve)

Response Rate Model for Blue County ACS-HU

Example: Expected Response Efficiency Rate (1)

- In Blue County the ACS-HU expected response rate is 90%; the expected production rate is 2.16 interviewing hours per case; and the expected eligibility rate is 95.9%.

- The expected response efficiency rate is 0.90 x 0.959 / 2.16 = **0.40 responses per interviewing hour.**

Example: Expected Response Efficiency Rate (2)

So how was the FR in the earlier example doing?

The ACS-HU FR with 0.40 responses per interviewing hour was just meeting expectations (0.40)

Why Not Stop at the Response Efficiency Rate?

Standards could be developed for response efficiency rates but…

- Notice that two surveys in the same area can have different expected response efficiency rates

- That means one standard per survey and area

- We'd wind up with as many or more standards than we have today

How can we unify the standards?

Point Efficiency Rate

Introduce a point system

- Puts all surveys and areas on equal footing

- Every case has points associated with it

- An FR earns those points for a response

Point Efficiency Rate:

the number of points earned per interviewing hour charged

Expected Point Efficiency Rate

Expected Point Efficiency Rate

    = (Expected Response Efficiency Rate)

      x (Points per Response)

If cases already had points we could calculate this. Instead, we flip it around. We calculate how many points to put on cases so Expected Point Efficiency Rate is always the same.

Deriving Points per Response

Let's stipulate that the Expected Point Efficiency Rate = *10 points per interviewing hour* for all surveys and areas. (Just a convenient number.)

Then fairness requires Points per Response

$$= \frac{10 \text{ Points per Interviewing Hour}}{\text{Expected Response Efficiency Rate}}$$

Example: Deriving Points per Response

- Recall that expected response efficiency rate in Blue County was **0.40** responses per interviewing hour for ACS-HU. For another survey is might be **0.20**.

- That means that Blue County ACS-HU cases will have 10/0.40 = **25 points** each. For the other survey 10/0.20 = **50 points** each.

Example: Point Efficiency Rate

- ACS-HU FR in Blue County got 12 responses, earning 12 x 25 = 300 points, and charged 30 interviewing hours. Point efficiency rate = 300/30 = 10 points per interviewing hour, just meeting performance expectations.

Implementation

- The key idea is to <u>show</u> the points associated with a case to the FR in their case management software

- FR can calculate their own performance easily ("Am I averaging more or less than ten points per interviewing hour?")

Survey	Case ID	Outcome	Point Value	Points Earned	Allocated Hours	Actual Hours	Point Efficiency Rate
ACS-HU	1234	Response	25	**25**			
ACS-HU	1235	Response	25	**25**			
ACS-HU	1236	Non-Response	25		10.50	**10.00**	**10.0**
ACS-HU	1237	Response	25	**25**			

Single Performance Standard for all FRs

Performance Level	Point efficiency rate (PER)
1 (unacceptable)	PER < 8.5
2	8.5 ≤ PER < 10.0
3 (expected)	**10.0** ≤ PER < 11.5
4	11.5 ≤ PER < 13.0
5 (great)	13.0 ≤ PER ☐

(These values are only notional.)

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Why Not Stop Here?

- For traditional survey designs, we're done!
  - The Point Efficiency Rate has equal expected value for all surveys and areas
  - That means we can develop a single standard for all FRs
- But... what about adaptive survey designs?

Adaptive Survey Designs

- Response efficiency rate assumed that all responses on a survey contribute equally to data quality

- A performance measure that rewards FR the same for all responses on a survey tends to frustrate adaptive design implementations

- Adaptive survey designs recognize that some responses may contribute more to data quality than others.

Example: Interviewing Priority (1)

- Imagine two interviewing priority levels on ACS-HU: *higher* and *lower*

- Translate these to different expected response rates: 90% (higher) and 60% (lower)

- Use model to get expected production rates: 2.16 (higher) and 1.35 (lower)

Response Rate Model for Blue County ACS-HU
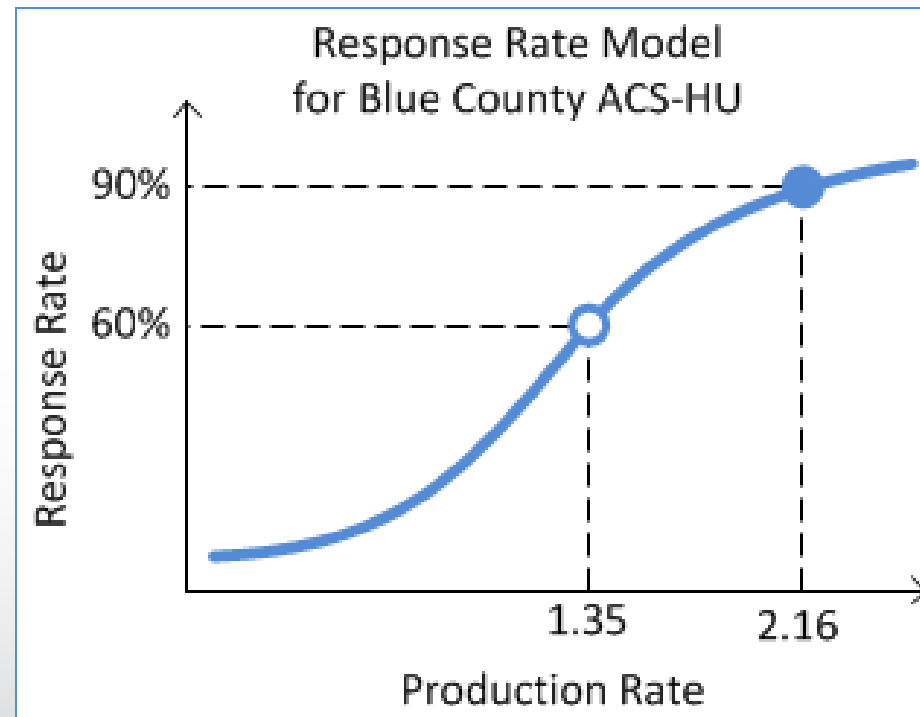
Example: Interviewing Priority (2)

- Calculate like different priorities like different surveys
- Calculate expected response efficiency rate
  - Low priority: 0.60 x 0.959 / 1.35 = **0.43** responses per hour
  - High priority: 0.90 x 0.959 / 2.16 = **0.40** responses per hour
- Calculate appropriate points per response
  - Low priority: 10/0.43 = **23** points
  - High priority: 10/.40 = **20** points
- Schedule FRs to work up to expected production rate
  - Low priority: **1.35** hours per case
  - High priority: **2.16** hours per case

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Example: Interviewing Priority (3)

- Notice an issue? We are specifying expected production rate differences across subsets of cases *within* a survey. We cannot measure that directly.

- Best solution may be a Stopping Rule:

  Stop interviewing cases on a survey within a given priority level when a target number of points is earned for that survey and priority level (based on expected response rate) or all of the allocated interviewing hours are expended for the survey (based on expected production rate), whichever happens first.

Conclusion

- Point Efficiency Rate allows for a single performance standard for all FRs

- It can be calculated across surveys for a single FR

- It can be calculated across FRs and surveys for a team

- It provides a framework for measuring performance under some adaptive survey designs

- It does require some changes in business practices (e.g., stopping rules).